

NaCl solutions of up to 2% and some up to 2.5%, but none germinated in 3% NaCl. After wetting for 24 h, the germinating seedlings were transferred to dry filter paper and desiccated under room conditions (20 to 25 °C and 15 to 20% R.H.) for 14 or 30 days. Then the seedlings were rewetted, each treatment with its original solution; seedlings that continued to grow after rewetting were counted as seedlings that had survived desiccation. Three of the four species were found to have seedlings with nearly 100% of desiccation tolerance. Even after 30 days of desiccation, seedlings continued to grow when rewetted with solutions of up to 2% NaCl. Only *K. prostrata* had low percentages of survival after desiccation. *Schismus arabicus* is one of the most common annual plants species inhabiting large areas of the extreme dry and saline desert in the Sahara–Arabian and Irano–Turanian regions of the Negev and Judean deserts of Israel. This species is one of the first plants in the Negev to germinate, even after small amounts of rain of about 10 to 15 mm. *S. arabicus* seeds (caryopses) may start to germinate within 6 h of wetting under optimal laboratory conditions. The ability of *S. arabicus* seeds to germinate and seedlings to survive long periods of desiccation was established when germinated and rewetted with distilled water. In the current sets of experiments it was found that *S. arabicus* seeds may germinate well in up to 2% NaCl and some germinate in 2.5% NaCl. Such seedlings may renew their growth and elongation after a period of desiccation when they are rewetted with solutions of up to a concentration of 2% NaCl. Such abilities of seedlings are not common but represent an important survival strategy for species inhabiting extreme dry and saline deserts with unpredictable amounts and distribution of rain.

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The use of the model species *Medicago truncatula* in studies on desiccation tolerance and sensitivity in seeds

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While many studies have been devoted to reveal the secrets of desiccation tolerance (DT) in seeds, less effort has been put into clarifying the recalcitrance phenomenon. The research on recalcitrant seeds faces a number of obstacles, the main one being the very limited time of availability of fresh seeds. Tree species can make the situation even more difficult, since they can alternate years of massive seed production with years of low or no production. The acquisition of more fundamental knowledge of the recalcitrance phenomenon is crucial for the advancement of *ex situ* conservation of germplasm from endangered species. Only with successful *ex situ* conservation protocols will the biodiversity of recalcitrant species be preserved. The non-existence of a model system for studies on recalcitrance can

account for the slow progress on this subject. Thus, it has been suggested that germinated orthodox seeds can be used as a model system for studies on recalcitrance, based on the fact that upon germination, orthodox seeds lose DT progressively, becoming comparable to the recalcitrant types. Many processes, at the physiological, cellular and molecular levels, involved with the loss of DT in germinated orthodox seeds, may be similar to those responsible for the desiccation sensitivity (DS) shown by recalcitrant seeds. Another advantage of working with germinated orthodox seeds is the feasibility of the re-establishment of its DT through the use of relatively simple techniques (such as osmotic stress and exogenous ABA). Such a system has thus the great advantage of allowing comparisons among different degrees of DT and DS within the same species, and appears as an outstanding tool for studies on the mechanisms responsible for these traits in seeds. The model species *Medicago truncatula* Gaertn. (Leguminosae, Papilionoideae), originally chosen for studies on symbiotic nitrogen fixation, produces orthodox seeds and for this reason can be useful for studies on seed biology. We have used this species in studies on DT/DS and the results have shown that it is a promising model system for such studies. By incubating germinated seeds in polyethylene glycol (PEG) it was possible to re-establish DT in radicles up to 2 mm long. Flow cytometric analyses showed that up to this length, there is no DNA synthesis, which was first detected in radicles with a length of 3 mm. Immunohistochemical detection of microtubules (MTs) showed that dehydration of germinated seeds with a 2 mm radicle, with or without PEG treatment caused disassembly of MTs and appearance of tubulin granules. Upon rehydration, neither MTs nor tubulin granules were detected in radicle cells of untreated seeds, while PEG-treated seeds were able to reconstitute the microtubular cytoskeleton and continue their normal development. Dehydration of untreated germinated seeds also led to an apoptotic-like DNA fragmentation in radicle cells, while in PEG-treated seeds DNA integrity was maintained. Studies on gene expression in radicles showed that transcript abundance of DT-related genes decreased during germination and increased by osmotic treatment, correlating with the loss and reacquisition of DT. All together, our results suggest that the occurrence of the first cell cycle appears to be an overriding factor that abolishes re-establishment of DT.

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Desiccation sensitivity of *Antiaris toxicaria* axes and reactive oxygen species scavenging enzymes in mitochondria

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Axes of *Antiaris toxicaria* seeds and washed mitochondria isolated from the axes were used as experimental materials in